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Attorneys for Defendants

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

OAKLAND DIVISION

REARDEN LLC et al.,

Plaintiffs,

vs.

THE WALT DISNEY COMPANY et al.,

Defendants,

REARDEN LLC et al.,

Plaintiffs,

vs.

TWENTIETH CENTURY FOX FILM CORPORATION et al.,

Defendants.

Case Nos. 4:17-cv-04006-JST
4:17-cv-04191-JST

DECLARATION OF HAO LI IN SUPPORT OF DEFENDANTS' MOTIONS FOR SUMMARY JUDGMENT ON CAUSAL NEXUS ISSUE

Judge: Hon. Jon S. Tigar
Date: To be set
Time: To be set
Ctrm.: 6 (2nd Floor)

I, Hao Li, hereby declare:

1. I am an assistant professor of Computer Science at the University of Southern California ("USC") and the director of the Vision and Graphics Lab at the USC Institute for Creative Technologies. I submit this declaration in support of the Defendants' Motion for Summary Judgment on the Causal Nexus Issue. I have personal knowledge of the facts set forth herein, except as to those stated on information and belief and, as to those, I am informed and believe them to be true. If called as a witness, I could and would testify competently to the facts stated herein.

BACKGROUND AND QUALIFICATIONS

2. I work in the field of computer graphics and computer vision, with a focus on capturing and digitizing humans and their performances. I develop systems and algorithms for facial performance capture and processing. I also am the CEO and co-founder of Pinscreen, a company in Los Angeles that develops consumer-accessible three-dimensional ("3D") avatar creation technology.

3. In 2011, I co-developed a performance-driven facial animation system called Faceshift, which was later acquired by Apple. I have been a research lead at the visual effects company Industrial Light & Magic; a visiting professor at the visual effects company Weta Digital; and a postdoctoral fellow at Columbia and Princeton Universities. In 2013, the MIT Technology Review named me a "top 35 innovator under 35" in recognition of my work in computer graphics. I also have been awarded the Google Faculty Award, the Okawa Foundation Research Grant, the Office of Naval Research Young Investigator Award, and the Andrew and Erna Viterbi Early Career Chair at the University of Southern California.

4. My descriptions of the facial motion capture process and of the use of outputs of that process in movie production are based on my research and academic experience, my own experience using outputs of the MOVA facial capture system while at the Industrial Light & Magic visual effects company, and my experience in movie production at the Weta Digital visual effects company.

5. A copy of my CV is attached as Exhibit A.

ASSIGNMENT

6. The Studio Defendants have asked me to describe the following: how facial motion capture systems work generally; how the MOVA system works in particular; and the general work that is involved to create a computer-generated ("CG") character after the MOVA system has been used to capture an actor's facial performance and output files created.

7. In forming my opinions, I considered Rearden's First Amended Complaint filed against Disney (Mar. 6, 2018), Dkt. 63 (No. 17-cv-04006).

HOW FACIAL MOTION CAPTURE WORKS

8. "Facial motion capture" describes a method for recording and processing the elements of an actor's facial movement for the purpose of animating a CG character's face. A facial motion capture system comprises hardware and software elements. The hardware elements are the physical tools that are used in capturing an actor's facial performance. The software element is the computer program that provides instructions for operating some of the hardware elements and processing the recorded data.

9. The two most common types of hardware used to capture an actor's facial performance are head-mounted cameras and static capture settings. A head-mounted camera consists of a helmet with a mount that holds one or more cameras pointed toward the face of the person wearing the helmet. A static capture setting is a physical frame that surrounds the actor's face during his performance. The frame may hold a single camera or an array of multiple cameras, as well as lights. Relative to a head-mounted camera, a static capture setting can make it easier to capture high-quality and high-resolution facial motion data because more cameras can be used; the actor's head and body movements can be constrained (so that the face is always visible to cameras); and external lighting can be controlled.

10. The software element of a facial motion capture system runs on a computer (or computers) connected to the hardware and controls and directs its operation. The software instructs the

hardware when to start and stop recording, and instructs the lights and cameras in the physical system when to turn on and off. If the hardware includes multiple cameras, the software may synchronize the data captured from different cameras, each of which will have a different view of the actor. The software may also be used to reorganize the captured data and process the output files for later use in the CG animation process.

11. A facial motion capture system can produce data about how a subject's face appears and moves. That data can then be used in the process of controlling the movements of the "face" of a 3D model.

THE MOVA SYSTEM

12. MOVA Contour is one type of facial motion capture system. I refer to the overall system as the "MOVA system." The MOVA system includes hardware and software elements.

13. As to hardware, MOVA employs a static capture setting with multiple cameras, white lights, and ultraviolet ("UV") lights. During a capture session, the actor wears phosphorescent makeup that is sprayed over his entire face to create a random pattern. The makeup pattern is not visible under the white lights, but is visible under the UV lights, and allows the cameras to capture high-quality data that accurately represents the 3D motion of the captured face. When the capture hardware is operating, the white and UV lights flash on and off in very rapid alternate succession. The cameras digitally record the facial performance under both lighting conditions.

14. A number of personnel are typically involved in a facial motion capture session.

a. The actor or subject must be present to perform.

b. Another person, sometimes called a motion capture supervisor, directs the actor's facial performance by leading the subject through relevant scenes or parts of scenes. A motion capture supervisor may also ask the actor to perform a set of key facial expressions based on or similar to the Facial Action Coding System ("FACS"). FACS is a taxonomy that breaks down human facial expressions based on the movements of individual muscles.

c. Other technical personnel are typically present to set up and operate various elements of the capture system, including to:

i. Ensure that the phosphorescent makeup is properly applied on the actor's face.

ii. Calibrate the cameras by positioning them in the capture setting and calculating the relative distances between and orientations of the cameras. The proper calibration of the cameras is important to the accuracy of the recorded data and its subsequent processing. Even a slight inaccuracy in the calibration can significantly deteriorate the capture quality.

iii. Manually control the motion capture software, including commanding the software to start and stop the recording.

iv. An engineer or other operator typically also organizes and stores the data that is collected.

15. I understand that Plaintiffs allege that temporary copies of MOVA software code are created in computer random access memory ("RAM") at two points in time: (1) when the MOVA system is utilized for the capture of facial motion data; and (2) when the MOVA system is utilized to process the captured data.

16. Software is normally stored on the hard drive of a computer. When the computer calls on the program, portions of the software code are typically copied into RAM to enable the use of the program.

17. When the MOVA system is used for the capture of facial motion data, the MOVA program would typically control the operation of the hardware's video recording operations, such as start recording, stop recording, turn lights on and off, and other setting adjustments. The software may also synchronize the data captured by multiple camera angles under both visible and UV light. The recordings of the captured data are stored on a hard drive.

18. When the MOVA system is used to process captured data, the MOVA program would typically assist in generating output files. In particular, the MOVA software tracks points on

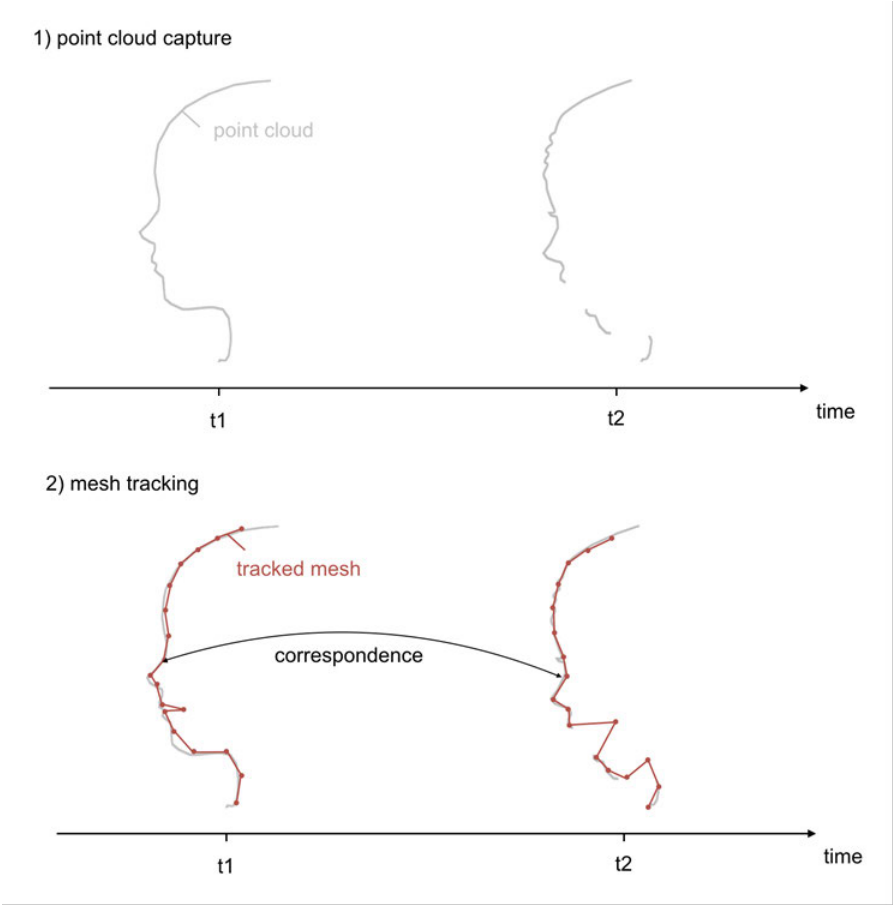
the face across frames of captured motion data. The software assists in generating one or more output files that constitute the "tracked mesh."

19. The following is a general overview of the process for creating the tracked mesh.

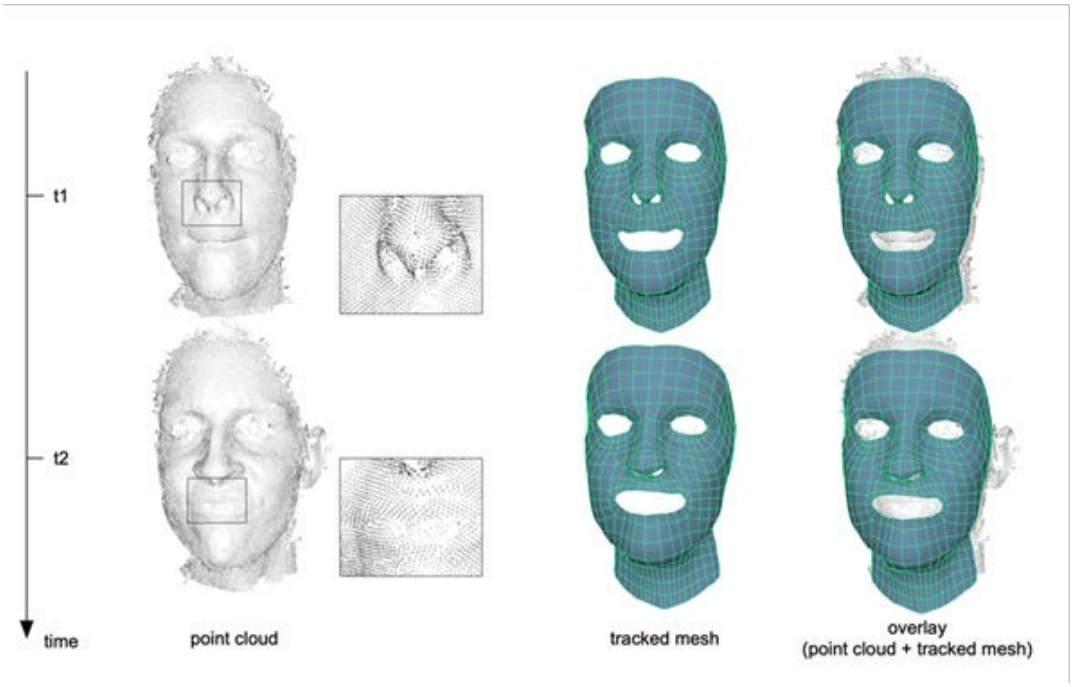
a. The captured video data is first translated into a "point cloud." A point cloud is data which consists of the subject face represented by thousands of 3D coordinates in space (which can be plotted on *x*, *y*, *z* axes). Each frame of facial movement is associated with a unique point cloud. The point cloud is an imperfect instrument for tracking facial motion for animation purposes, because as the face moves across frames (*i.e.*, over time), the set of points in the point cloud does not remain consistent. In particular, correspondences between points from frame to frame cannot be determined.

b. The point cloud is modified into the tracked mesh through the identification of a set of specific points on the face that can be consistently tracked across frames. The end product of tracking points across frames of facial motion is a "tracked mesh." The tracked mesh is made up of vertices, which are specific data points, and edges, which are line segments that connect the vertices. When rendered on a computer display, the tracked mesh will appear as a web-like diagram of the face. The vertices and edges will follow, or "track," facial motion based on the movement of specific points on the face across multiple frames of a particular take of the actor's facial performance.

c. The following images use simplified solid-line, two-dimensional representations of a point cloud and tracked mesh to demonstrate how (1) the raw point cloud data does not permit consistent tracking of facial features across time and frames of facial movement; whereas (2) the tracked mesh data traces specific points on the face to create reliable correspondences that do permit consistent tracking across time and frames of facial movement.



d. The following image shows point cloud data next to the corresponding wireframe tracked mesh. The vertical axis marks two different points in time to show how both the point cloud and the tracked mesh change as the face moves over time.



20. The tracked mesh is created in the following way.

a. The vertices of a "generic mesh" are mapped onto the point cloud of the actor's face, either manually or through software. The generic mesh is a coarse mesh form that is not based on a specific subject's face, but has a general facial form with vertices that can be mapped onto the captured facial data of any subject. Once mapped onto the actor's face, the mesh form is used to track the actor's facial motion through frames of captured facial movement, and becomes the tracked mesh.

b. The MOVA software supplies an algorithm that the engineer can use to adapt the mesh over time and across frames of facial capture data. The final tracked mesh incorporates the data from the selected sequence of facial motion capture.

c. In my experience, the MOVA algorithm alone would not be sufficiently robust to track accurately all of the movements of the actor's facial performance. For

example, automated tracking may produce errors due to a problem called "drift" which refers to the accumulation of small errors that are necessarily introduced by the algorithm in each frame because it is unable to track facial points with 100% accuracy across frames. In addition, the MOVA algorithm may not be able to reliably track facial points across frames when the change in facial expressions between consecutive frames is large—for example, when a neutral face is changed into an intense, angry face, with the actor's mouth wide open. Therefore, an engineer must intervene to guide and adjust the tracking of the mesh. Without manual intervention, errors introduced by the algorithm would accumulate over time, leading to significant inaccuracies in the final tracked mesh, especially for complex recordings (which may be no longer than a few seconds if the facial motion is fast-paced or dramatic). These errors would make the tracked mesh unusable.

d. The tracked mesh that is produced does not cover critical regions of the face such as the skin around the eyes and the lip region (as well as teeth and tongue). Tracking is difficult in those regions because facial expressions are intricate. As a result, there is a significant amount of change in the geometry of points for tracking in those areas. The tracked mesh also does not cover the ears or the top and back of the head.

USE OF THE OUTPUT FILES OF THE MOVA SYSTEM

21. The tracked mesh is delivered to the visual effects studio. The tracked mesh can be used by the visual effects studio to map the facial motion of the actor onto a computerized 3D model of the face of the target CG character. This 3D model is like a facial puppet that engineers and visual artists are able to manipulate to perform a broad range of facial expressions. I refer to this 3D model as the "target rig." The visual effects studio may also use point cloud files and raw video footage of a capture session as reference material when the studio is creating the target rig.

22. The target rig is typically created by animators from scratch through a stylized artistic process. Animators also model the rig to form specific facial expressions, which are also created by hand. Animators may use modeling and animation software such as Maya, ZBrush, or Zeno to create the rig and also to change the rig's facial expressions, a process called "deforming."

23. Ultimately, the animators modify the shape of the target rig to perform the desired sequence of facial expressions for the character. The process of translating facial motion onto the rig is described as mapping or "retargeting."

24. The tracked mesh can be used to develop the target rig by deforming the rig to create specific facial expressions, thereby expanding the range of facial movement of the target rig. I am also aware that the tracked mesh can be used to assist with developing the animation of the target rig, by providing data about the actor's captured facial performance. The process of mapping the tracked mesh to the target rig involves the use of software that is not MOVA software. The additional software includes what is called a "retargeting solver." The retargeting solver translates the *xyz* coordinates of vertices in the tracked mesh into computer parameters that correspond to facial movements of the target rig. As the *xyz* coordinates of vertices in the tracked mesh vary, the parameters generated by the retargeting solver vary accordingly and result in corresponding movements of the facial expressions of the target rig.

25. Human involvement is extensive in the retargeting process. An artist may need to refine the rig to remedy inaccuracies or deficiencies of automatic tracking, such as, for example, the sticking together of the lips at the corners of the mouth. Digital artists may also refine the mapped performance for stylistic reasons, such as the director's preference for a more exaggerated facial expression. Digital artists will also need to add the movement of eye and lip regions, not fully captured by the tracked mesh, to the retargeted performance.

26. After retargeting, hundreds or even thousands of hours of human labor and artistry are still necessary to further develop the target rig and to create and animate the face of the character that appears onscreen.

    a. *Modeling*: The face must be developed with color, texture, shading, and other details. The onscreen face of a CG character contains pore-level details, skin color

and tone, changes in texture (such as wrinkles for particular expressions), and even changes in skin tone based on emotion (for example, blood flow to the cheeks to depict anger). Any hair on the face and head must also be modeled. Each of these details is critical to the creation of the final character, and must be layered onto the target rig. These details may be the product of manual artistry or other techniques, none of which would involve the MOVA system. The work is often done by a separate, dedicated team. To model and perfect the additional details for a CG character's face requires weeks if not months of labor by multiple digital artists.

b. *Animation/Simulation*: As noted above, there are gaps in MOVA data that must be manually filled even for basic facial motion, such as deficiencies in automated tracking and in the motion of the eyes and lips. Additionally, certain specific kinds of facial movement are not captured by the performance-driven process, such as contact between a face and another object (*e.g.*, the punching of a face), or secondary facial motion caused by the character's movement (*e.g.*, jiggling when jumping or shaking the head). Animators must create all of this movement separately without the use of the MOVA system. For simulations, a technical director or animator will determine computer parameters to simulate the particular facial movement, essentially employing a trial and error process to adjust the parameters until it "looks right." Production teams typically include individuals who specialize in the particular job of refining these computer parameters. Once the computer parameters are satisfactory, the simulation may still require further refinement based on the artistic preference of the production team. This process can take weeks or months.

c. *Rendering*: All of the work up to this point creates a version of the character which is only visible on a computer through the use of 3D-viewer software. This version must be converted into a two-dimensional image that can be shown onscreen. That conversion process is called rendering, and includes all of the facial components—the shape and motion of the face, the color, the texture, the shading, and other

attributes. There is an entire team of digital artists (often ten or twenty individuals) that specialize in rendering. They select a rendering approach, set up or develop appropriate software, configure software parameters, and incorporate artistic direction (such as ensuring that the overall look matches the desired appearance of the character). This rendering process takes months. The final rendering must also incorporate the lighting and the illumination of the entire scene. That step of the process is highly human-assisted, and at the same time the automated computation of the rendering alone can take hours per frame. MOVA is not involved in this process.

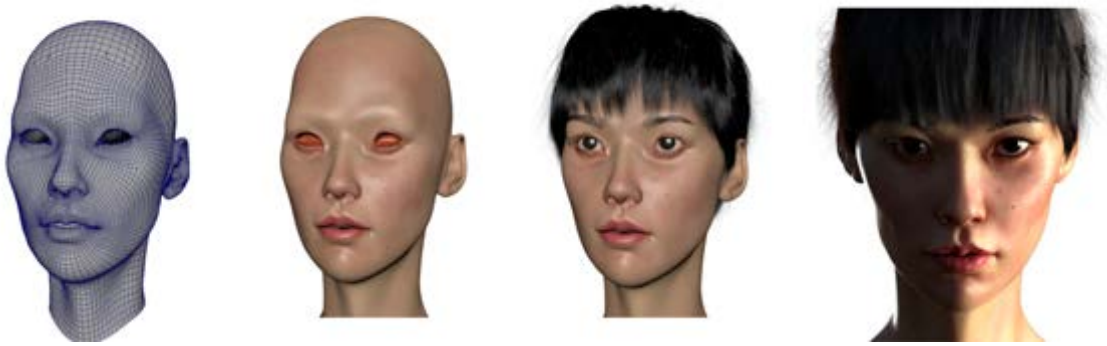
27. The following images show an example of a target facial rig in various stages of development. Moving from left to right:

a. The first image shows the initial facial rig of a CG character with a neutral facial expression. This is how the rig appears immediately after the incorporation of facial motion data.

b. The second image shows the facial rig of the CG character with initial skin texturing, including color and facial features.

c. The third image shows the facial rig of the CG character with texturing and secondary components (such as eye balls and hair).

d. The fourth image shows the final rendered face of the CG character with texturing, secondary components, and lighting.

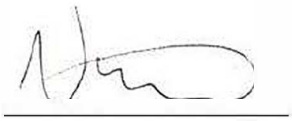


28. The final character also requires development of the body and voice.

a. *Body*: The MOVA system requires that the actor's body be still and involves only facial performance. Thus, a separate full-body capture session is typically necessary, using an appropriate system for capturing full-body motion. Typically, the performer will wear a specialized motion capture suit often with markers (*e.g.*, reflective balls) on it, and the body performance will be tracked using specialized high-speed cameras. As with the MOVA system, the data may be converted into a set of 3D points that can be retargeted to a model of the target CG character. Manual cleanup and adjustment is typically necessary after retargeting. Creation of the body performance may also require that certain extreme stunts be manually animated or simulated.

b. *Voice*: Voice performance may be done at the same time as MOVA-involved facial capture, on set, or separately; and the voice must then be incorporated into the final character. This process is typically less complex than the work that goes into the character's face, but it can still require hours of additional work, especially if there is a separate actor giving the voice performance.

I declare under penalty of perjury under the laws of the United States that the foregoing is true and correct and that I executed this declaration this 27th day of February 2019 at Orlando, Florida.



Hao Li

EXHIBIT A

HaoLi

CEO & Co-Founder, Pinscreen Inc.
Assistant Professor of Computer Science, Andrew & Erna Viterbi Early Career Chair, USC
Director of the Vision and Graphics Lab, USC Institute for Creative Technologies

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PROFILE

Date of birth 17/01/1981
Place of birth Saarbrücken, Germany
Citizenship German
Languages German, French, English, and Mandarin Chinese (all fluent and no accents)

COMMITMENT

I work at the intersection between Computer Graphics, Computer Vision, and Machine Learning, with focus on photorealistic human digitization, real-time performance capture using deep learning and data-driven techniques. I'm known for my work in dynamic geometry processing, non-rigid registration, real-time facial performance capture, hair digitization, and 3D avatar modeling. My research has led to the facial animation technology in Apple's iPhone X, I worked on the digital reenactment of Paul Walker in the movie Furious 7, and my algorithms on deformable shape alignment have improved the radiation treatment for cancer patients all over the world.

I have been named one of the world's top 35 innovator under 35 by MIT Technology Review in 2013 and NextGen10: Innovators under 40 by C-Suite Quaterly in 2014. I received the Office of Naval Research (ONR) Young Investigator Award in 2018, the Google Faculty Research Award, the Okawa Foundation Research Grant, and the Andrew and Erna Viterbi Early Career Chair in 2015, the Swiss National Science Foundation fellowship for prospective researchers in 2011, and the best paper award at SCA 2009. I am ranked #1 on Microsoft Academic in 2016 on the top 10 leaderboard in Computer Graphics for the past five years. I am member of the Global Future Councils of the World Economic Forum (WEF) and co-organized the first CONIX Mixed Reality Workshop in 2018.

Google Scholar **https://scholar.google.com/citations?user=NFeigSoAAAAJ&hl=en**

EDUCATION

Ph. D., Computer Science **07/2006 - 11/2010**
ETH Zurich, Department of Computer Science

- Thesis: *Animation Reconstruction of Deformable Surfaces*
  Advisor: Prof. M. Pauly

M. Sc., Computer Science **10/2000 - 01/2006**
Universität Karlsruhe (TH), Department of Computer Sciences

- Thesis: *Reconstruction of Colored Objects from Structured Illuminated Views*
  Advisor: Prof. H. Prautzsch
- Major 1: Computer graphics and geometric modeling
- Major 2: Cryptography and security
- Minor: Differential and projective geometry

ERASMUS Student Exchange, Computer Science **10/2002 - 09/2003**
Institut National Polytechnique de Grenoble, ENSIMAG

French-German High School Diploma **09/1992 - 05/1999**
Lycée Franco-Allemand de Sarrebruck, Germany

POSITIONS

USC Institute for Creative Technologies **08/2016 - ongoing**
Director of the Vision and Graphics Lab

Pinscreen Inc. **10/2015 - ongoing**
CEO & Co-Founder

University of Southern California **08/2013 - ongoing**
Tenure-track Assistant Professor, Computer Science Department

Weta Digital **06/2014 - 08/2014**
Visiting Professor, Virtual Studio Group

Industrial Light & Magic, Lucasfilm Ltd. **04/2012 - 07/2013**
Research Lead, R&D Group

Columbia University **04/2011 - 03/2012**
Postdoctoral Fellow, Columbia Computer Graphics Group

Princeton University **04/2011 - 03/2012**
Visiting Postdoctoral Researcher, Princeton Computer Graphics Group

École Polytechnique Fédérale de Lausanne **02/2010 - 04/2011**
Visiting and Postdoctoral Researcher, Computer Graphics and Geometry Laboratory

Industrial Light & Magic, Lucasfilm Ltd. **07/2009 - 10/2009**
Research Intern, R&D Group

Stanford University **07/2008 - 09/2008**
Visiting Researcher, Geometric Computing Group

ETH Zurich **07/2006 - 11/2010**
Research Assistant, Applied Geometry Group

National University of Singapore **01/2006 - 07/2006**
Visiting Research Scholar, Centre for Information Mining and Extraction

TEACHING

Lecturer

University of Southern California, Computer Science Department

- CSCI 621: Digital Geometry Processing (Lecture) SS 2017, SS 2018, and SS 2019
- CSCI 420: Computer Graphics (Lecture) FS 2014, FS 2015, FS 2017, and FS 2018
- CSCI 599: Digital Geometry Processing (Lecture) SS 2014 and SS 2015

Guest Lecturer

University of Southern California, Computer Science Department

- CSCI 576: Multimedia Systems Design (Lecture) FS 2016
- EE 598: Electrical Engineering Research Seminar (Lecture) SS 2016
- CSCI 697: Seminar in Computer Science Research (Lecture) FS 2015 and FS 2017
- CSCI 109: Introduction to Computing (Lecture) SS 2014 and FS 2015
- CSCI 597: Seminar in Computer Science Research (Lecture) FS 2013
- ENGR 102: Freshmen Academies (Lecture) FS 2013

Stanford University, Computer Science Department

- CS148: Introduction to Computer Graphics & Imaging (Lecture) 2012

Columbia University, Computer Science Department

- Computer Graphics (Lecture) 2011

Teaching Assistant

École Polytechnique Fédérale de Lausanne, School of Computer and Communication Sciences

- Digital 3D Geometry Processing (Lecture) 2010
- Computer Graphics (Lecture) 2010

ETH Zurich, Department of Computer Science

- Surface Representation and Geometric Modeling (Lecture) 2007, 2008, and 2009
- Introduction to Computer Graphics (Lecture) 2006, 2007, 2008, and 2009
- Advanced Topics in Computer Graphics (Seminar) 2006 and 2007
- Geometric Computing (Seminar) 2008

MENTORING

Supervision

University of Southern California, Computer Science Department

- Kyle Morgenroth, PhD Student **09/2018 - ongoing**
- Pengda Xiang, PhD Student **09/2018 - ongoing**
- Haiwei Chen, PhD Student **09/2018 - ongoing**
- Shichen Liu, PhD Student **09/2018 - ongoing**
- Sitao Xiang, PhD Student **09/2016 - ongoing**
- Zimo Li, PhD Student **09/2016 - ongoing**
- Zeng Huang, PhD Student **09/2016 - ongoing**
- Zhou Yi, PhD Student **09/2016 - ongoing**
- Tianye Li, PhD Student (MSc in 2015) **11/2015 - ongoing**
- Shunsuke Saito, PhD Student **09/2015 - ongoing**
- Kyle Olszewski, PhD Student **09/2014 - ongoing**
- Lingyu Wei, PhD Student (PhD defense in 03/2018) **09/2014 - 05/2018**
- Liwen Hu, PhD Student (MSc in 2013 and PhD defense in 11/2018) **09/2014 - 01/2019**
- Nitika Aggarwal, MSc Student **01/2014 - 05/2014**
- Ronald Yu, MSc Student (next stop: Stanford University) **10/2016 - 05/2018**
- Carrie Sun, BSc Student **01/2014 - 05/2014**
- Lizhi Fan, BSc Student **01/2015 - 05/2015**
- Natalie Monger, BSc Student **09/2016 - 05/2017**
- Dr. Chongyang Ma, Postdoctoral Researcher (next stop: Snap Inc.) **09/2013 - 06/2015**

USC Institute for Creative Technologies, Vision and Graphics Lab

- Kathleen Haase, Special Projects Manager **06/2016 - ongoing**
- Jun Xing, Postdoctoral Researcher **05/2017 - ongoing**
- Weikai Chen, Postdoctoral Researcher **06/2017 - ongoing**
- Yajie Zhao, Postdoctoral Researcher **10/2017 - ongoing**
- Mingming He, Postdoctoral Researcher **12/2018 - ongoing**
- Loc Huynh, PhD Student **08/2017 - ongoing**
- Kalle Bladin, Research Programmer **08/2017 - ongoing**
- Pratusha Prasad, Research Programmer (MSc in 2016) **06/2016 - ongoing**
- Xinglei Ren, Research Programmer (MSc in 2017) **04/2017 - ongoing**
- Bipin Kishore, Research Programmer (MSc in 2017) **04/2017 - ongoing**
- Chinmay Chinara, Research Programmer (MSc in 2018) **05/2018 - ongoing**
- Aakash Shanbhag, Research Programmer (MSc in 2018) **05/2018 - ongoing**
- Marcel Ramos, Digital Artist **06/2016 - ongoing**
- Owen Ingraham, Digital Artist **07/2018 - ongoing**
- Christina Trejo, Project Coordinator **06/2016 - ongoing**
- Andrew Jones, Sr. Research Associate (next stop: Raxium Inc.) **06/2016 - 01/2018**

Columbia University, Computer Science Department

- Nathaniel Clinger, BSc Student **01/2012 - 05/2012**
- Papoj Thamjaroenporn, BSc Student **01/2012 - 05/2012**
- Pei-Lun Hsieh, MSc Student **01/2012 - 05/2012**
- Xiaochen Hu, BSc Student **01/2012 - 05/2012**

EPFL, School of Computer and Communication Sciences

- Alexandru Ichim, MSc Student **06/2010 - 09/2010**

ETH Zurich, Department of Computer Science

- Huw Bowles, MSc Student **11/2008 - 05/2009**
- Jens Puwein, MSc Student **02/2008 - 08/2008**
- Jeroen Dries, MSc Student **09/2006 - 03/2007**

PhD Defense

- Liwen Hu, *University of Southern California* **11/2018**
- Lingyu Wei, *University of Southern California* **03/2018**
- Jens Windau, *University of Southern California* **11/2017**
- Yi Guo, *University of Southern California* **03/2017**
- Kai Chang, *University of Southern California* **02/2017**
- Srinath Sridhar, *Saarland University / Max Planck Institute for Informatics* **12/2016**
- Hongyi Xu, *University of Southern California* **11/2016**
- Morten Bojsen-Hansen, *IST Austria* **07/2016**
- Koki Nagano, *University of Southern California* **04/2016**
- Sema Berkiten, *Princeton University* **02/2016**
- Paul Graham, *University of Southern California* **05/2014**
- Zhuoliang Kang, *University of Southern California* **04/2014**

PhD Qualifying Committee

- Yi Zhou, *University of Southern California* **01/2019**
- Loc Huynh, *University of Southern California* **05/2018**
- Weiyue Wang, *University of Southern California* **04/2018**
- Chloe Legendre, *University of Southern California* **03/2018**
- Lingyu Wei, *University of Southern California* **11/2017**
- Yijing Li, *University of Southern California* **05/2017**
- Sean Mason, *University of Southern California* **03/2017**
- Soravit Changpinyo, *University of Southern California* **11/2016**
- Yi Guo, *University of Southern California* **12/2015**
- Inkyu Kim, *University of Southern California* **08/2016**
- Matthias Hernandez, *University of Southern California* **05/2016**
- Tran Tuan Anh, *University of Southern California* **04/2016**
- Arnav Aghaarwal, *University of Southern California* **04/2016**
- Kai Chang, *University of Southern California* **02/2016**
- Ruizhe Wang, *University of Southern California* **12/2015**
- Rongqi Qiu, *University of Southern California* **08/2015**
- Christian Potthast, *University of Southern California* **05/2015**
- Kai Chang, *University of Southern California* **05/2015**
- Guan Pang, *University of Southern California* **05/2014**
- Mohammad Abdel-Majeed, *University of Southern California* **03/2014**
- Paul Graham, *University of Southern California* **09/2013**
- Andrew Jones, *University of Southern California* **09/2013**
- Morten Bojsen-Hansen, *IST Austria* **07/2012**
- Breannan Smith, *Columbia University* **03/2012**

Outreach

University of Southern California, Computer Science Department

- USC Viterbi EngX 2019 (ONR STEM)
- USC London Hackathon 2018

- USC Academic Career Mentoring Panel 2017
- USC Viterbi K-12 STEM: Coding and Animation (Screening and Panel) 2015

ACADEMIC SERVICES

University of Southern California, Computer Science Department

- SCA IMGD / CSGames Faculty Tenure Committee, FS 2018
- CS Department PhD Admissions Committee, FS 2018
- SCA IMGD / CSGames Faculty Search Committee, SS 2018
- CS Department PhD Admissions Committee, FS 2017
- Annual Faculty Merit Review Committee, SS 2017
- CS Department PhD Admissions Committee, FS 2016
- CS Department Faculty Search Committee, FS 2015
- CS Department PhD Admissions Committee, FS 2015
- CS Department Faculty Search Committee, FS 2014
- CS Department Transformative Committee, FS 2013
- Co-Chair of CS Department Colloquium Committee, FS 2013

CONSULTING

Munger, Tolles & Olson LLP	**10/2018 - ongoing**
Huawei	**09/2015 - 09/2016**
LEIA, Inc.	**04/2015 - 10/2015**
L Squared Capital Partners	**03/2015 - 04/2015**
Oculus VR/Facebook	**08/2014 - 07/2015**
Embodee Corp.	**03/2014 - 05/2015**
Pelican Imaging	**02/2014 - 11-2016**
Innored, Inc.	**09/2013 - 01/2014**
Disney Research Zurich	**09/2013 - 09/2016**
Industrial Light & Magic, Lucasfilm Ltd.	**07/2013 - 06/2014**
The Jig Lab	**07/2013 - 05/2014**
Tuxedo Agency	**11/2012 - 11/2012**
Artec Group, Inc	**08/2011 - 12/2014**
3Gear Systems	**05/2011 - 04/2012**
XYZ RGB, Inc.	**07/2011 - 01/2012**
Max Planck Institute for Intelligent Systems	**05/2011 - 11/2011**
C-RAD AB	**08/2010 - 08/2011**
Mova LLC	**08/2010 - 10/2010**
Filmakademie Baden-Württemberg GmbH, Institute for Animation	**04/2010 - 07/2010**
Aguru Images, Inc.	**08/2008 - 07/2009**

RESEARCH GRANTS & GIFTS

Total Funding Awarded to PI: $13,621,159, where $3,507,525 for USC and $10,113,634 for USC/ICT.

Federal Funding ($8,892,055)

U.S. Government
Project Nexus: Lifelike Digital Human Replica
Duration: 09/01/2018 – 08/31/2019
Award Amount: $1,000,000
Role: PI (USC/ICT)

Army Research Office (ARO)
RTO: Scalable and Efficient Light Stage Pipeline for High-Fidelity Face Digitization
Duration: 09/01/2018 – 08/31/2019
Award Amount: $200,000

Role: PI (USC/ICT)
U.S. Army Natick (NATICK)
High-Fidelity Rigging and Shading of Virtual Soldiers
Duration: 09/01/2018 – 03/31/2019
Award Amount: $157,500
Role: PI (USC/ICT)

Office of Naval Research (ONR - HPTE)
Young Investigator Program (YIP): Complete Human Digitization and Unconstrained Performance Capture
Duration: 06/01/2018 - 05/31/2021
Award Amount: $591,509
Role: PI (USC)

Semiconductor Research Corporation (SRC) / Defense Advanced Research Projects Agency (DARPA)
JUMP: Computing On Network Infrastructure for Pervasive, Cognition, and Action
Duration: 01/01/2018 - 12/31/2022
Award Amount: $1,174,818
Role: PI (USC)

Army Research Office (ARO)
UARC 6.1/6.2: Avatar Digitization & Immersive Communication Using Deep Learning
Duration: 11/01/2017 - 10/31/2019
Award Amount: $2,821,000
Role: PI (USC/ICT)

Army Research Office (ARO)
RTO: Strip-Based Hair Modeling Using Virtual Reality
Duration: 11/01/2017 - 10/31/2018
Award Amount: $250,000
Role: PI (USC/ICT)

Army Research Office (ARO)
RTO: Head-Mounted Facial Capture & Rendering for Augmented Reality
Duration: 11/01/2017 - 10/31/2018
Award Amount: $200,000
Role: PI (USC/ICT)

Army Research Office (ARO)
UARC 6.1/6.2: Capture, Rendering, & Display for Virtual Humans
Duration: 11/01/2016 - 10/31/2017
Award Amount: $1,408,011
Role: PI (USC/ICT)

United States SHARP Academy (ARO)
Digital SHARP Survivor
Duration: 07/01/2016 - 06/31/2017
Award Amount: $94,953
Role: PI (USC/ICT)

Army Research Office (ARO)
RTO: Lighting Reproduction for RGB Camouflage
Duration: 01/01/2016 - 12/31/2017
Award Amount: $200,000
Role: PI (USC/ICT)

U.S. Army Natick (NATICK)
Research Contract
Duration: 09/01/2015 - 12/31/2016
Award Amount: $145,000
Role: PI (USC/ICT)

Office of Naval Research (ONR)
Markerless Performance Capture for Automated Functional Movement Screening
Duration: 08/01/2015 - 09/30/2017
Award Amount: $230,000
Role: PI (USC)

Intelligence Advanced Research Projects Activity (IARPA), Department of Defense (DoD)
GLAIVE: Graphics and Learning Aided Vision Engine for Janus
Duration: 07/25/2014 - 07/24/2018
Award Amount: $419,264
Role: Co-PI (USC)

Industry Funding ($3,140,938)

Softbank Corp.
3D Modeled, Rigged, and Animated Characters from 2D Video
Duration: 01/01/2019 – 01/01/2020
Award Amount: $111,534
Role: Co-PI (USC)

Snap Inc.
Research Gift Donation
Date: 10/29/2018
Award Amount: $20,000
Role: PI (USC)

TOEI Company, Ltd.
Research Contract
Duration: 06/01/2018 – 03/01/2019
Award Amount: $580,000
Role: PI (USC/ICT)

Lightstage, LLC / Otoy
Research Contract
Duration: 05/15/2018 – 12/31/2018
Award Amount: $152,000
Role: PI (USC/ICT)

Sony Corporation
Highly Sparse Volumetric Capture Using Deep Learning
Duration: 05/01/2018 - 04/31/2019
Award Amount: $120,000
Role: PI (USC)

Sony Corporation
Geometry and Appearance Synthesis for 3D Human Performance Capture
Duration: 05/01/2017 - 04/31/2018
Award Amount: $120,000
Role: PI (USC)

Adobe Systems Inc.
Research Gift Donation
Date: 08/09/2017
Award Amount: $20,000
Role: PI (USC)

Mediafront Inc.
Research Contract
Date: 06/28/2017
Award Amount: $38,095
Role: PI (USC/ICT)

Activision Publishing Inc.
Research Contract
Date: 05/09/2017
Award Amount: $21,593
Role: PI (USC/ICT)

Electronic Arts Inc.
Research Contract
Duration: 12/01/2016 - 12/01/2018
Award Amount: $460,000
Role: PI (USC/ICT)

SOOVII Digital Media Technology, Ltd
Research Contract
Date: 11/01/2016
Award Amount: $1,080,000
Role: PI (USC/ICT)

RL Leaders, LLC
Research Contract
Date: 10/01/2016
Award Amount: $630,216
Role: PI (USC/ICT)

Sony Corporation
Shape and Reflectance Estimation via Polarization Analysis
Duration: 08/12/2016 - 08/23/2017
Award Amount: $50,000
Role: PI (USC/ICT)

Adobe Systems Inc.
Research Gift Donation
Date: 01/07/2016
Award Amount: $10,000
Role: PI (USC)

Sony Corporation
Unconstrained Dynamic Shape Capture
Duration: 11/01/2015 - 10/31/2016
Award Amount: $123,500
Role: PI (USC)

Facebook / Oculus
Facebook Award
Date: 10/14/2015
Award Amount: $25,000
Role: PI (USC)

Huawei
Development of a 3D Hair Database
Date: 09/01/2015
Award Amount: $50,000
Role: PI (USC)

Okawa Foundation
Okawa Foundation Award
Date: 10/08/2015
Award Amount: $10,000
Role: PI (USC)

Adobe Systems Inc.
Research Gift Donation
Date: 04/27/2015
Award Amount: $9,000
Role: PI (USC)

Embodee Corporation
Research Gift Donation
Date: 03/17/2015
Award Amount: $70,000
Role: PI (USC)

Google
Google Faculty Research Award: Data-Driven Framework for Unified Face and Hair Digitization
Date: 02/12/2015
Award Amount: $52,000
Role: PI (USC)

Facebook / Oculus
Facebook Award
Date: 02/03/2015
Award Amount: $25,000
Role: PI (USC)

Panasonic Corporation
Markerless Real-Time Facial Performance Capture
Date: 09/22/2014
Award Amount: $20,000
Role: PI (USC)

Pelican Imaging Corporation
Research Gift Donation
Date: 07/22/2014
Award Amount: $50,000
Role: PI (USC)

Innored Inc.
Research Gift Donation
Date: 11/01/2013
Award Amount: $25,000
Role: PI (USC)

University Funding ($856,166)

USC Shoah Foundation Institute
New Dimensions in Testimony
Duration: 05/01/2016 - 09/31/2017
Award Amount: $625,266
Role: PI (USC/ICT)

University of Southern California
Andrew and Erna Viterbi Early Career Chair
Start Date: 08/16/2015
Award Amount: $20,000 (to date)
Role: PI (USC)

University of Southern California - Integrated Media System Center (IMSC)
IMSC Award
Duration: 07/01/2013 - 06/30/2014
Award Amount: $11,000
Role: PI (USC)

University of Southern California
USC Start-up Funding
Start Date: 09/01/2013
Award Amount: $199,900
Role: PI (USC)

AWARDS & HONORS

Office of Naval Research (ONR) Young Investigator Program (YIP) Award	**02/2018**
USC Stevens Commercialization Award	**05/2017**
Microsoft Academic Top 10 Leaderboard in the past 5 years in Computer Graphics (ranking #1)	**05/2016**
World Technology Award Fellow	**10/2015**
Andrew and Erna Viterbi Early Career Chair	**10/2015**
Okawa Foundation Research Grant	**09/2015**
Google Faculty Research Award	**02/2015**
C-Suite Quaterly NextGen 10: Innovators under 40	**01/2014**
World's top 35 innovator under 35 by MIT Technology Review	**08/2013**
Swiss National Science Foundation fellowship for prospective researchers	**03/2011**
ACM Symposium on Computer Animation Best Paper Award '09	**08/2009**
National Science Foundation 3DPVT '06 Student Travel Stipend	**05/2006**
German Academic Exchange Service (DAAD) fellowship	**01/2006**
Karl-Steinbuch scholarship of the MFG Baden-Württemberg	**10/2005**
Thomas Gessmann-Stiftung fellowship, German Science Foundation	**09/2004**
Baden-Württemberg scholarship of the Markel Foundation	**10/2004**
Scholarship of the Richard Winter foundation	**09/2004**
ERASMUS scholarship	**10/2002**
E-fellows scholarship	**11/2001**

PEER-REVIEWED JOURNAL & CONFERENCE PAPERS

[51] PAGAN: REAL-TIME AVATARS USING DYNAMIC TEXTURES
Koki Nagano, Jaewoo Seo, Jun Xing, Lingyu Wei, Zimo Li, Shunsuke Saito, Aviral Agarwal, Jens Fursund, Hao Li
ACM Transactions on Graphics, Proceedings of the 11th ACM SIGGRAPH Conference and Exhibition in Asia (SIGGRAPH Asia 2018), 12/2018

[50] 3D HAIR SYNTHESIS USING VOLUMETRIC VARIATIONAL AUTOENCODERS
Shunsuke Saito, Liwen Hu, Chongyang Ma, Hikaru Ibayashi, Linjie Luo, Hao Li
ACM Transactions on Graphics, Proceedings of the 11th ACM SIGGRAPH Conference and Exhibition in Asia (SIGGRAPH Asia 2018), 12/2018

[49] REAL-TIME HAIR RENDERING USING SEQUENTIAL ADVERSARIAL NETWORKS
Lingyu Wei, Liwen Hu, Vladimir Kim, Ersin Yumer, Hao Li
Proceedings of the 15th European Conference on Computer Vision, (ECCV 2018), 09/2018

[48] HAIRNET: SINGLE-VIEW HAIR RECONSTRUCTION USING CONVOLUTIONAL NEURAL NETWORKS
Yi Zhou, Liwen Hu, Jun Xing, Weikai Chen, Han-Wei Kung, Xin Tong, Hao Li
Proceedings of the 15th European Conference on Computer Vision, (ECCV 2018), 09/2018

[47] DEEP VOLUMETRIC VIDEO FROM VERY SPARSE MULTI-VIEW PERFORMANCE CAPTURE
Zeng Huang, Tianye Li, Weikai Chen, Yajie Zhao, Jun Xing, Chloe LeGendre, Linjie Luo, Chongyang Ma, Hao Li
Proceedings of the 15th European Conference on Computer Vision, (ECCV 2018), 09/2018

[46] HYBRID FUSION: REAL-TIME PERFORMANCE CAPTURE USING A SINGLE DEPTH SENSOR AND SPARSE IMUS
Zerong Zheng, Tao Yu, Hao Li, Kaiwen Guo, Qionghai Dai, Lu Fang, Yebin Liu
Proceedings of the 15th European Conference on Computer Vision, (ECCV 2018), 09/2018

[45] CONTEXTUAL-BASED IMAGE INPAINTING: INFER, MATCH, AND TRANSLATE
Yuhang Song, Chao Yang, Zhe Lin, Xiaofeng Liu, Qin Huang, Hao Li, C.-C. Jay Kuo
Proceedings of the 15th European Conference on Computer Vision, (ECCV 2018), 09/2018

[44] HIGH-FIDELITY FACIAL REFLECTANCE AND GEOMETRY INFERENCE FROM AN UNCONSTRAINED IMAGE
Shugo Yamaguchi, Shunsuke Saito, Koki Nagano, Yajie Zhao, Weikai Chen, Kyle Olszewski, Shigeo Morishima, Hao Li
ACM Transactions on Graphics, Proceedings of the 45th ACM SIGGRAPH Conference and Exhibition (SIGGRAPH 2018), 08/2018

[43] MESOSCOPIC FACIAL GEOMETRY INFERENCE USING DEEP NEURAL NETWORKS
Loc Huynh, Weikai Chen, Shunsuke Saito, Jun Xing, Koki Nagano, Andrew Jones, Paul Debevec, Hao Li
Proceedings of the 31st IEEE International Conference on Computer Vision and Pattern Recognition, (CVPR 2018 Spotlight Presentation), 06/2018

[42] DOUBLE FUSION: REAL-TIME CAPTURE OF HUMAN PERFORMANCES WITH INNER BODY SHAPES FROM A SINGLE DEPTH SENSOR
Tao Yu, Zerong Zheng, Kaiwen Guo, Jianhui Zhao, Qionghai Dai, Hao Li, Gerard Pons-Moll, Yebin Liu
Proceedings of the 31st IEEE International Conference on Computer Vision and Pattern Recognition, (CVPR 2018 Oral Presentation), 06/2018

[41] AUTO-CONDITIONED RECURRENT NETWORKS FOR EXTENDED COMPLEX HUMAN MOTION SYNTHESIS
Zimo Li, Yi Zhou, Shuangjio Xiao, Chong He, Zeng Huang, Hao Li
Proceedings of the Sixth International Conference on Learning Representations, arXiv:1707.05363, (ICLR 2018), 04/2018

[40] AVATAR DIGITIZATION FROM A SINGLE IMAGE FOR REAL-TIME RENDERING
Liwen Hu, Shunsuke Saito, Lingyu Wei, Koki Nagano, Jaewoo Seo, Jens Fursund, Iman Sadeghi, Carrie Sun, Yen-Chun Chen, Hao Li
ACM Transactions on Graphics, Proceedings of the 10th ACM SIGGRAPH Conference and Exhibition in Asia (SIGGRAPH Asia 2017), 11/2017

[39] LEARNING A MODEL OF FACIAL SHAPE AND EXPRESSION FROM 4D SCANS
Tianye Li, Timo Bolkart, Michael J. Black, Hao Li, Javier Romero
ACM Transactions on Graphics, Proceedings of the 10th ACM SIGGRAPH Conference and Exhibition in Asia (SIGGRAPH Asia 2017), 11/2017

[38] LEARNING DENSE FACIAL CORRESPONDENCES IN UNCONSTRAINED IMAGES
Ronald Yu, Shunsuke Saito, Haoxiang Li, Duygu Ceylan, Hao Li
Proceedings of the IEEE International Conference on Computer Vision 2017 (ICCV 2017), 10/2017

[37] REALISTIC DYNAMIC FACIAL TEXTURES FROM A SINGLE IMAGE USING GANS
Kyle Olszewski, Zimo Li, Chao Yang, Yi Zhou, Ronald Yu, Zeng Huang, Sitao Xiang, Shunsuke Saito, Pushmeet Kohli, Hao Li
Proceedings of the IEEE International Conference on Computer Vision 2017 (ICCV 2017), 10/2017

[36] PRODUCTION-LEVEL FACIAL PERFORMANCE CAPTURE USING DEEP CONVOLUTIONAL NEURAL NET-WORKS
Samuli Laine, Tero Karras, Timo Aila, Antti Herva, Shunsuke Saito, Ronald Yu, Hao Li, Jaakko Lehtinen
Proceedings of the 16th ACM SIGGRAPH / Eurographics Symposium on Computer Animation, arXiv:1609.06536 (SCA 2017), 07/2017

[35] PHOTOREALISTIC FACIAL TEXTURE INFERENCE USING DEEP NEURAL NETWORKS
Shunsuke Saito, Lingyu Wei, Liwen Hu, Koki Nagano, Hao Li
Proceedings of the 30th IEEE International Conference on Computer Vision and Pattern Recognition, arXiv:1612.00523 (CVPR 2017 Spotlight Presentation), 07/2017

[34] HIGH-RESOLUTION IMAGE INPAINTING USING MULTI-SCALE NEURAL PATCH SYNTHESIS
Chao Yang, Xin Lu, Zhe Lin, Eli Shechtman, Oliver Wang, Hao Li
Proceedings of the 30th IEEE International Conference on Computer Vision and Pattern Recognition, arXiv:1611.09969 (CVPR 2017), 07/2017

[33] SIMULATION-READY HAIR CAPTURE
Liwen Hu, Derek Bradley, Hao Li, Thabo Beeler
Computer Graphics Forum 36(2), Proceedings of the 38th Annual Conference of the European Association for Computer Graphics (Eurographics 2017), 04/2017

[32] MULTI-VIEW STEREO ON CONSISTENT FACE TOPOLOGY
Graham Fyffe, Koki Nagano, Loc Huynh, Shunsuke Saito, Jay Bush, Andrew Jones, Hao Li, Paul Debevec
Computer Graphics Forum 36(2), Proceedings of the 38th Annual Conference of the European Association for Computer Graphics (Eurographics 2017), 04/2017

[31] LEARNING DETAIL TRANSFER BASED ON GEOMETRIC FEATURES
Sema Berkiten, Maciej Halber, Justin Solomon, Chongyang Ma, Hao Li, Szymon Rusinkiewicz
Computer Graphics Forum 36(2), Proceedings of the 38th Annual Conference of the European Association for Computer Graphics (Eurographics 2017), 04/2017

[30] HIGH-FIDELITY FACIAL AND SPEECH ANIMATION FOR VR HMDS
Kyle Olszewski, Joseph J. Lim, Shunsuke Saito, Hao Li
ACM Transactions on Graphics, Proceedings of the 9th ACM SIGGRAPH Conference and Exhibition in Asia (SIGGRAPH Asia 2016), 12/2016

[29] REAL-TIME FACIAL SEGMENTATION AND PERFORMANCE CAPTURE FROM RGB INPUT
Shunsuke Saito, Tianye Li, Hao Li
Proceedings of the 14th European Conference on Computer Vision, arXiv:1604.02801 (ECCV 2016), 10/2016

[28] CAPTURING DYNAMIC TEXTURED SURFACES OF MOVING TARGETS
Ruizhe Wang, Lingyu Wei, Etienne Vouga, Qixing Huang, Duygu Ceylan, Gerard Medioni, Hao Li
Proceedings of the 14th European Conference on Computer Vision, arXiv:1604.02801 (ECCV 2016 Spotlight Presentation), 10/2016

[27] DENSE HUMAN BODY CORRESPONDENCES USING CONVOLUTIONAL NETWORKS
Lingyu Wei, Qixing Huang, Duygu Ceylan, Etienne Vouga, Hao Li
Proceedings of the 29th IEEE International Conference on Computer Vision and Pattern Recognition, arXiv:1511.05904 (CVPR 2016 Oral Presentation), 06/2016

[26] RAPID PHOTOREALISTIC BLENDSHAPE MODELING FROM RGB-D SENSORS
Dan Casas, Andrew Feng, Oleg Alexander, Graham Fyffe, Paul Debevec, Ryosuke Ichikari, Hao Li, Kyle Olszewski, Evan Suma, Ari Shapiro
Computer Animation and Virtual Worlds 2016, Proceedings of the 29th Conference on Computer Animation and Social Agents (CASA 2016), 05/2016

[25] PATIENT-SPECIFIC ASSESSMENT OF DYSMORPHISM OF THE FEMORAL HEAD-NECK JUNCTION: A STATISTICAL SHAPE MODEL APPROACH
Vikas Khanduja, Nick Baelde, Andreas Dobbelaere, Jan Van Houcke, Hao Li, Christophe Pattyn, Emmanuel A. Audenaert
The International Journal of Medical Robotics and Computer Assisted Surgery 2015 (MRCAS 2015), 12/2015

[24] FACIAL PERFORMANCE SENSING HEAD-MOUNTED DISPLAY
Hao Li, Laura Trutoiu, Kyle Olszewski, Lingyu Wei, Tristan Trutna, Pei-Lun Hsieh, Aaron Nicholls, Chongyang Ma
ACM Transactions on Graphics, Proceedings of the 42nd ACM SIGGRAPH Conference and Exhibition (SIGGRAPH 2015), 08/2015

[23] SINGLE-VIEW HAIR MODELING USING A HAIRSTYLE DATABASE
Liwen Hu, Chongyang Ma, Linjie Luo, Hao Li
ACM Transactions on Graphics, Proceedings of the 42nd ACM SIGGRAPH Conference and Exhibition (SIGGRAPH 2015), 08/2015

[22] SKIN MICROSTRUCTURE DEFORMATION WITH DISPLACEMENT MAP CONVOLUTION
Koki Nagano, Graham Fyffe, Oleg Alexander, Jernej Barbič, Hao Li, Abhijeet Ghosh, Paul Debevec
ACM Transactions on Graphics, Proceedings of the 42nd ACM SIGGRAPH Conference and Exhibition (SIGGRAPH 2015), 08/2015

[21] UNCONSTRAINED REALTIME FACIAL PERFORMANCE CAPTURE
Pei-Lun Hsieh, Chongyang Ma, Jihun Yu, Hao Li
Proceedings of the 28th IEEE International Conference on Computer Vision and Pattern Recognition (CVPR 2015), 06/2015

[20] CAPTURING BRAIDED HAIRSTYLES
Liwen Hu, Chongyang Ma, Linjie Luo, Li-Yi Wei, Hao Li
ACM Transactions on Graphics, Proceedings of the 7th ACM SIGGRAPH Conference and Exhibition in Asia (SIGGRAPH Asia 2014), 12/2014

[19] ROBUST HAIR CAPTURE USING SIMULATED EXAMPLES
Liwen Hu, Chongyang Ma, Linjie Luo, Hao Li
ACM Transactions on Graphics, Proceedings of the 41st ACM SIGGRAPH Conference and Exhibition (SIGGRAPH 2014), 08/2014

[18] RAPID AVATAR CAPTURE AND SIMULATION USING COMMODITY DEPTH SENSORS
Ari Shapiro, Andrew Feng, Ruizhe Wang, Hao Li, Mark Bolas, Gerard Medioni, Evan Suma
Computer Animation and Virtual Worlds 2014, Proceedings of the 27th Conference on Computer Animation and Social Agents (CASA 2014), 05/2014

[17] DEPTH SENSOR-BASED REALTIME TUMOR TRACKING FOR ACCURATE RADIATION THERAPY
Björn Nutti, Åsa Kronander, Mattias Nilsing, Kristofer Maad, Cristina Svensson, Hao Li
Eurographics 2014 Short Papers presented at the 35th Annual Conference of the European Association for Computer Graphics (Eurographics 2014 Short Papers), 04/2014

[16] A STATISTICAL SHAPE MODEL OF TROCHLEAR DYSPLASIA OF THE KNEE
Annemieke Van Haver, Peter Mahieu, Tom Claessens, Hao Li, Christophe Pattyn, Peter Verdonk, Emmanuel A. Audenaert
The Knee Journal Elsevier (KNEE 2013), 12/2013

[15] 3D SELF-PORTRAITS
Hao Li, Etienne Vouga, Anton Gudym, Jonathan T. Barron, Linjie Luo, Gleb Gusev
ACM Transactions on Graphics, Proceedings of the 6th ACM SIGGRAPH Conference and Exhibition in Asia (SIGGRAPH Asia 2013), 11/2013

[14] REALTIME FACIAL ANIMATION WITH ON-THE-FLY CORRECTIVES
Hao Li, Jihun Yu, Yuting Ye, Chris Bregler
ACM Transactions on Graphics, Proceedings of the 40th ACM SIGGRAPH Conference and Exhibition (SIGGRAPH 2013), 07/2013

[13] STRUCTURE-AWARE HAIR CAPTURE
Linjie Luo, Hao Li, Szymon Rusinkiewicz
ACM Transactions on Graphics, Proceedings of the 40th ACM SIGGRAPH Conference and Exhibition (SIGGRAPH 2013), 07/2013

[12] TRACKING SURFACES WITH EVOLVING TOPOLOGY
Morten Bojsen-Hansen, Hao Li, Chris Wojtan
ACM Transactions on Graphics, Proceedings of the 39th ACM SIGGRAPH Conference and Exhibition (SIGGRAPH 2012), 08/2012

[11] TEMPORALLY COHERENT COMPLETION OF DYNAMIC SHAPES
Hao Li, Linjie Luo, Daniel Vlasic, Pieter Peers, Jovan Popović, Mark Pauly, Szymon Rusinkiewicz
ACM Transactions on Graphics 31(1), Presented at the 39th ACM SIGGRAPH Conference and Exhibition (SIGGRAPH 2012), 08/2012

[10] MAPPING CARDIAC SURFACE MECHANICS WITH STRUCTURED LIGHT IMAGING
Jacob I. Laughner, Song Zhang, Hao Li, Connie C. Shao, Igor R. Efimov
American Journal of Physiology, Heart and Circulatory Physiology 2012 Jul 13, PMID: 22796539 (AJP Heart 2012), 07/2012

[9] MULTI-VIEW HAIR CAPTURE USING ORIENTATION FIELDS
Linjie Luo, Hao Li, Sylvain Paris, Thibaut Weise, Mark Pauly, Szymon Rusinkiewicz
Proceedings of the 25th IEEE International Conference on Computer Vision and Pattern Recognition (CVPR 2012), 06/2012

[8] FACTORED FACADE ACQUISITION USING SYMMETRIC LINE ARRANGEMENTS
Duygu Ceylan, Niloy J. Mitra, Hao Li, Thibaut Weise, Mark Pauly
Computer Graphics Forum 31(2), Proceedings of the 33rd Annual Conference of the European Association for Computer Graphics (Eurographics 2012), 05/2012

[7] REALTIME PERFORMANCE-BASED FACIAL ANIMATION
Thibaut Weise, Sofien Bouaziz, Hao Li, Mark Pauly
ACM Transactions on Graphics, Proceedings of the 38th ACM SIGGRAPH Conference and Exhibition (SIGGRAPH 2011), 08/2011

[6] EXAMPLE-BASED FACIAL RIGGING
Hao Li, Thibaut Weise, Mark Pauly
ACM Transactions on Graphics, Proceedings of the 37th ACM SIGGRAPH Conference and Exhibition (SIGGRAPH 2010), 07/2010

[5] ROBUST SINGLE VIEW GEOMETRY AND MOTION RECONSTRUCTION
Hao Li, Bart Adams, Leonidas J. Guibas, Mark Pauly
ACM Transactions on Graphics, Proceedings of the 2nd ACM SIGGRAPH Conference and Exhibition in Asia (SIGGRAPH Asia 2009), 12/2009

[4] FACE/OFF: LIVE FACIAL PUPPETRY (BEST PAPER AWARD)
Thibaut Weise, Hao Li, Luc Van Gool, Mark Pauly
Proceedings of the 8th ACM SIGGRAPH / Eurographics Symposium on Computer Animation (SCA 2009), 08/2009

[3] GLOBAL CORRESPONDENCE OPTIMIZATION FOR NON-RIGID REGISTRATION OF DEPTH SCANS
Hao Li, Robert W. Sumner, Mark Pauly
Computer Graphics Forum 27(5), Proceedings of the 6th Eurographics Symposium on Geometry Processing (SGP 2008), 07/2008

[2] STRUCTURED LIGHT BASED RECONSTRUCTION UNDER LOCAL SPATIAL COHERENCE ASSUMPTION
Hao Li, Raphael Straub, Hartmut Prautzsch
Proceedings of the 3rd IEEE International Symposium on 3D Data Processing, Visualization and Transmission (3DPVT 2006), 06/2006

[1] FAST SUBPIXEL ACCURATE RECONSTRUCTION USING COLOR STRUCTURED LIGHT
Hao Li, Raphael Straub, Hartmut Prautzsch
Proceedings of the Fourth IASTED International Conference on Visualization, Imaging and Image Processing (VIIP 2004), 09/2004

COURSE NOTES, TECH TALKS & EXHIBITIONS

[20] PINSCREEN AVATARS IN YOUR POCKET: MOBILE PAGAN ENGINE AND PERSONALIZED GAMING
Koki Nagano, Shunsuke Saito, Mclean Goldwhite, Kyle San, Aaron Hong, Liwen Hu, Lingyu Wei, Jun Xing, Qingguo Xu, Hanwei Kung, Jiale Kuang, Aviral Agarwal, Erik Castellanos, Jaewoo Seo, Jens Fursund, Hao Li
ACM SIGGRAPH Asia 2018 Real-Time Live!, 12/2018

[19] DEEP LEARNING-BASED PHOTOREAL AVATARS FOR ONLINE VIRTUAL WORLDS ON IOS
Koki Nagano, Jaewoo Seo, Jun Xing, Kyle San, Aaron Hong, Mclean Goldwhite, Jiale Kuang, Aviral Agarwal, Caleb Arthur, Hanwei Kung, Stuti Rastogi, Carrie Sun, Stephen Chen, Jens Fursund, Hao Li
ACM SIGGRAPH 2018 Real-Time Live!, 08/2018

[18] TRUTH IN IMAGES, VIDEOS, AND GRAPHICS
Chris Bregler, Alyosha Efros, Irfan Essa, Hany Farid, Ira Kemelmacher-Shlizerman, Matthias Nießner, Luisa Verdoliva, Hao Li
ACM SIGGRAPH 2018 Sunday Workshop, 08/2018

[17] PINSCREEN: CREATING PERFORMANCE-DRIVEN AVATARS IN SECONDS
Hao Li, Liwen Hu, Koki Nagano, Jaewoo Seo, Shunsuke Saito, Lingyu Wei, Iman Sadeghi, Jens Fursund, Yen-Chun Chen, Stephen Chen, Carrie Sun
ACM SIGGRAPH 2017 Real-Time Live!, 08/2017

[16] PINSCREEN: 3D AVATAR FROM A SINGLE IMAGE
Hao Li, Shunsuke Saito, Jens Fursund, Lingyu Wei, Liwen Hu, Chao Yang, Ronald Yu, Stephen Chen, Isabella Benavente, Yen-Chun Chen
ACM SIGGRAPH Asia 2016 Emerging Technologies, 12/2016

[15] GEOMETRIC DEEP LEARNING
Jonathan Masci, Emanuelle Rodolà, Davide Boscaini, Michael M. Bronstein, Hao Li
ACM SIGGRAPH Asia 2016 Courses, 12/2016

[14] MODERN TECHNIQUES AND APPLICATIONS FOR REAL-TIME NON-RIGID REGISTRATION
Andrea Tagliasacchi, Hao Li
ACM SIGGRAPH Asia 2016 Courses, 12/2016

[13] CANCER MOONSHOT: SXSL - MARKERLESS FACIAL PERFORMANCE CAPTURE
Hao Li
SXSL South by South Lawn: A White House Festival of Ideas, Art, and Action, Interactive Exhibit, 10/2015

[12] CREATING AVATARS FROM A SINGLE IMAGE AND BRINGING THEM TO LIFE
Hao Li, Shunsuke Saito
ACM SIGGRAPH 2016 Experience Presentations, 07/2016

[11] DIGITIZING THE HUMAN BODY: FROM VR, CONSUMER, TO HEALTH APPLICATIONS
Hao Li, Tristan Swedish, Pratik Shah, Lingyu Wei, Ramesh Raskar
ACM SIGGRAPH 2016 Courses, 07/2016

[10] MODELING AND CAPTURING THE HUMAN BODY: FOR RENDERING, HEALTH, AND VISUALIZATION
Hao Li, Anshuman Das, Tristan Swedish, Hyunsung Park, Ramesh Raskar
ACM SIGGRAPH 2015 Courses, 08/2015

[9] HOLOCHAT: 3D AVATARS ON MOBILE LIGHT FIELD DISPLAYS
Jing Liu, Armand Niederberger, Jihun Yu, Hao Li, David Fattal
ACM SIGGRAPH 2015 Emerging Technologies, 08/2015

[8] DIGITAL IRA AND BEYOND: CREATING PHOTOREAL REAL-TIME DIGITAL CHARACTERS
Javier von der Pahlen, Jorge Jimenez, Etienne Danvoye, Paul Debevec, Graham Fyffe, Hao Li
ACM SIGGRAPH 2014 Courses, 08/2014

[7] MAKE YOUR OWN AVATAR
Ari Shapiro, Andrew Feng, Ruizhe Wang, Hao Li, Mark Bolas, Gerard Medioni, Evan Suma
ACM SIGGRAPH 2014 Real-Time Live!, 08/2014

[6] MEASUREMENT AND MODELING OF MICROFACET DISTRIBUTION UNDER DEFORMATION
Koki Nagano, Oleg Alexander, Jernej Barbic, Hao Li, Paul Debevec
ACM SIGGRAPH 2014 Talks, 08/2014

[5] RAPID AVATAR CAPTURE AND SIMULATION USING COMMODITY DEPTH SENSORS
Ari Shapiro, Andrew Feng, Ruizhe Wang, Hao Li, Mark Bolas, Gerard Medioni, Evan Suma
ACM SIGGRAPH 2014 Talks, 08/2014

[4] DYNAMIC GEOMETRY PROCESSING
Will Chang, Hao Li, Niloy J. Mitra, Mark Pauly, Michael Wand
Eurographics 2012 Tutorial Notes, 05/2012

[3] KINECT-BASED FACIAL ANIMATION
Thibaut Weise, Sofien Bouaziz, Hao Li, Mark Pauly
ACM SIGGRAPH Asia 2011 Emerging Technologies, 12/2011

[2] COMPUTING CORRESPONDENCES IN GEOMETRIC DATA SETS
Will Chang, Hao Li, Niloy J. Mitra, Mark Pauly, Szymon Rusinkiewicz, Michael Wand
Eurographics 2011 Tutorial Notes, 04/2011

[1] GEOMETRIC REGISTRATION FOR DEFORMABLE SHAPES
Will Chang, Hao Li, Niloy J. Mitra, Mark Pauly, Michael Wand
Eurographics 2010 Tutorial Notes, 05/2010

TECHNICAL REPORTS & PATENTS

[8] TECHNICAL PERSPECTIVE: PHOTOREALISTIC FACIAL DIGITIZATION AND MANIPULATION
Hao Li
Communications of the ACM, January 2019, Vol. 62 No. 1
(CACM 2019), 01/2019

[7] ON THE EFFECTS OF BATCH AND WEIGHT NORMALIZATION IN GENERATIVE ADVERSARIAL NETWORKS
Sitao Xiang, Hao Li
arXiv:1704.03971
(arXiv 2017), 04/2017

[6] INSPIRING COMPUTER VISION SYSTEM SOLUTIONS
Julian Zilly, Amit Boyarski, Micael Carvalho, Amir Atapour Abarghouei, Konstantinos Amplianitis, Aleksandr Krasnov, Massimiliano Mancini, Hernán Gonzalez, Riccardo Spezialetti, Carlos Sampredo Pérez, Hao Li
arXiv:1707.07210
(arXiv 2017 Best ICVSS Reading Group Prize), 07/2017

[5] BREAKING THE BARRIERS TO TRUE AUGMENTED REALITY
Christian Sandor, Martin Fuchs, Alvaro Cassinelli, Hao Li, Richard Newcombe, Goshiro Yamamoto, Steven Feiner
arXiv:1512.05471
(arXiv 2015), 12/2015

[4] REALTIME FACIAL ANIMATION WITH ON-THE-FLY CORRECTIVES
Hao Li, Jihun Yu, Yuting Ye, Chris Bregler
US Patent (US14/141348), filed 08/2012

[3] A METHOD FOR FACIAL ANIMATION
Thibaut Weise, Sofien Bouaziz, Hao Li, Mark Pauly
US Patent (US13/323231), filed 12/2011

[2] DYNAMIC HAIR CAPTURE
Linjie Luo, Hao Li, Thibaut Weise, Sylvain Paris, Mark Pauly, Szymon Rusinkiewicz
Technical Report, Princeton University, 08/2011

[1] FIRST STEPS TOWARD THE AUTOMATIC REGISTRATION OF DEFORMABLE SCANS
Hao Li, Mark Pauly
Technical Report, ETH Zurich, 06/2007

THESES

ANIMATION RECONSTRUCTION OF DEFORMABLE SURFACES
Hao Li
PhD dissertation, ETH Zurich, 11/2010

REKONSTRUKTION FARBIGER OBJEKTE AUS STRUKTURIERT BELEUCHTETEN ANSICHTEN
Hao Li
Diplomarbeit, Universität Karlsruhe (TH), 06/2005

RECONSTRUCTION USING STRUCTURED LIGHT
Hao Li
Studienarbeit, Universität Karlsruhe (TH), 02/2004

FILM CREDITS

The Fifth Estate: The Deepfake (CBC, Himself)	**2018**
Follow This (BuzzFeed/Netflix, Himself)	**2018**
Blade Runner 2049 (USC Institute for Creative Technologies, Light Stage Processing Supervisor)	**2017**
Valerian and the City of a Thousand Planets (Vision & Graphics Lab, Director)	**2017**
Furious 7 (Weta Digital, Researcher)	**2015**
The Hobbit: The Battle of the Five Armies (Weta Digital, Researcher)	**2014**
Noah (ILM, R&D)	**2014**
Captain America: The Winter Soldier (ILM, R&D)	**2014**
Snickers - Hungry Face Morph	**2013**
Star Trek Into Darkness (ILM, R&D)	**2013**
The Lone Ranger (ILM, R&D)	**2013**
Pacific Rim (ILM, R&D)	**2013**
Space Pirate Captain Harlock	**2013**
G.I. Joe: Retaliation (ILM, R&D)	**2012**
Maattrraan	**2012**
Yellow	**2012**
3D Underwater Motion Capture of Dana Vollmer Olympic Gold Medalist 2012	**2012**

INVITED TALKS

COMPLETE 3D HUMAN DIGITIZATION
Speaker, ONR HPT&E Technical Review: Warrior Resilience 2019, Orlando Science Center, Orlando, 02/2019

AI AND HUMAN DIGITIZATION: WHEN SEEING IS NOT BELIEVING?
Speaker, DARPA MediFor PI Meeting 2019, DARPA Conference Center, Arlington, 02/2019
Speaker, EmTech Asia 2019, Singapore, 01/2019
Keynote Speaker, DISRUPT.SYDNEY 2018, Sydney, 09/2018
Speaker, IET EngTalks, London, 09/2018

PHOTOREALISTIC HUMAN DIGITIZATION AND RENDERING USING DEEP LEARNING
Speaker, Softbank Open Innovation The Second BBM Summit 2018, Hakodate, 12/2018

Invited Talk, Sony Corporation, Tokyo, 12/2018
Invited Talk, Waseda University, Tokyo, 12/2018
Keynote Speaker, VRST 2018, Tokyo, 12/2018
Invited Talk, Dreamscape Immersive, Los Angeles, 08/2018
Invited Talk, Amazon, Seattle, 08/2018
Speaker, US Army TRADOC Workshop 2018, Los Angeles, 08/2018
Speaker, Machine Learning for 3D Understanding, TUM Institute for Advanced Study, Munich, 07/2018
Speaker, Sixth International Workshop on Computer Vision 2018, Modena, 05/2018
Keynote Speaker, CMS Meeting of the Minds, Caltech, Pasadena, 05/2018

THE FUTURE OF MIXED REALITY
Speaker, First CONIX Annual Review 2018, Carnegie Mellon University, Pittsburgh, 09/2018

3D AVATARS, VIRTUAL REALITY, AND DEEP LEARNING
Speaker, USC London Delegation Trip 2018, London, 02/2018

THE FUTURE OF FAKE NEWS
Speaker, World Congress of Science and Factual Producers, San Francisco, 12/2017

VIRTUAL AVATAR CREATION USING DEEP LEARNING
Speaker, SIGGRAPH Asia Symposium on AR and VR 2017, Bangkok, 12/2017

DIGITAL HUMAN TELEPORTATION USING DEEP LEARNING
Speaker, USC Viterbi Corporate Advisory Board Meeting, Los Angeles, 04/2018
Keynote Speaker, CVMP 2017, London, 11/2017
Speaker, Sony US Research Center, San Jose, 11/2017
Keynote Speaker, SoftBank Ventures Forum 2017, Seoul, 10/2017
Speaker, USC China Miniforum, Los Angeles, 9/2017
Speaker, SCA 2017 Symposium on Computer Animation, Los Angeles, 7/2017
Speaker, ICVSS 2017 International Computer Vision Summer School, Sicily, 7/2017
Keynote Speaker, ACM SIGGRAPH Taipei Chapter Computer Graphics Workshop 2017, Taichung, 6/2017
Keynote Speaker, S3PM 2017 International Convention on Shape, Solid, Structure, & Physical Modeling, Berkeley, 6/2017
Speaker, FMX 2017, Stuttgart, 05/2017
Invited Talk, Ochanomizu University, Tokyo, 2/2017

CAPTURE, RENDERING, AND DISPLAY FOR VIRTUAL HUMANS
Speaker, UARC ICT Mission Projects 2017, Los Angeles, 02/2017

LEARNING CORRESPONDENCES BETWEEN CLOTHED HUMAN SHAPES
Speaker, ECCV Workshop on Geometry Meets Deep Learning 2016, Amsterdam, 10/2016

MARKERLESS MOTION CAPTURE
Speaker, Human Performance, Training & Education Tech Review, Quantico US Marine Corps Base, Stafford County, 10/2016

REAL-TIME FACIAL MOTION CAPTURE AND ITS APPLICATIONS
Speaker, 4th Huawei Smart Device Summit on Multimedia Technology, Shenzhen, 09/2016

DEMOCRATIZING HUMAN DIGITIZATION
Invited talk, Nickelodeon Animation Studio, Burbank, 02/2017
Keynote Speaker, SIGGRAPH Asia Workshop on Virtual Reality Meets Physical Reality 2016, Macao, 12/2016
Speaker, The Real Deal @ USC, Los Angeles, 11/2016
Speaker, TEDxHollywood, Los Angeles, 09/2016

DEEP LEARNING: A NEW TOOL FOR CONTENT CREATION AND GAME DESIGN
Speaker, SIGGRAPH 2016 Special Session, Open Problems in Real-Time Rendering, Anaheim, 07/2016

TÊTE-À-TÊTE IN CYBERSPACE
Speaker, Fifth International Workshop on Computer Vision 2016, Lecce, 05/2016

DIGITIZING HUMANS INTO VR USING DEEP LEARNING
Speaker, REAL 2016, San Francisco, 3/2016
Speaker, NVidia Deep Learning Workshop, Los Angeles, 02/2016

MARKERLESS PERFORMANCE CAPTURE FOR AUTOMATED FUNCTIONAL MOVEMENT SYSTEM
Speaker, Warrior Resilience Tech Review, Office of Naval Research, Arlington, 02/2016

BRIDGING PHYSICAL AND DIGITAL WORLDS
Speaker, 16th KOCSEA Technical Symposium 2015, Harvey Mudd College, Claremont, 12/2015
Speaker, SLUSH Conference 2015, Helsinki, 11/2015
Speaker, USC Global Conference 2015, Shanghai, 10/2015

HUMAN DIGITIZATION AND FACIAL PERFORMANCE CAPTURE FOR SOCIAL INTERACTIONS IN VR
Speaker, VRLA Winter Expo, Los Angeles, 01/2016
Invited Talk, Google, Seattle, 10/2015
Invited Talk, Disney Consumer Products, Glendale, 07/2015
Invited Talk, MIT Computer Graphics Group, Massachusetts Institute of Technology, Cambridge, 06/2015

SOCIAL INTERACTION IN CYBERSPACE
Speaker, SLUSH Future Brunch, No Name Club, Los Angeles, 05/2015

DATA-DRIVEN HAIRSTYLING
Speaker, Workshop on Functoriality in Geometric Data 2015, HKUST IAS, Hong Kong, 04/2015

IMMERSIVE TELEPRESENCE WITH 3D SENSING AND VR HMD
Speaker, USC Integrated Media Systems Center Retreat 2015, Los Angeles, 04/2015

DEMOCRATIZING 3D HUMAN CAPTURE: GETTING HAIRY!
Invited Talk, Google, Mountain View, 09/2015
Speaker, Rotary Club, Santa Monica, 09/2015
Invited Talk, Intel, Santa Clara, 06/2015
Invited Talk, Apple, Cupertino, 05/2015
IST Lunch Bunch, Caltech, Pasadena, 05/2015
Invited Talk, SnapChat, Venice, 04/2015
Speaker, LA ACM SIGGRAPH Innovative Research in Computer Graphics at USC and ICT, Los Angeles, 03/2015
Keynote Speaker, International Conference on 3D Vision, Tokyo, 12/2014
Keynote Speaker, ACM SIGGRAPH Conference on Motion in Games 2014, Los Angeles, 11/2014

THE FUTURE OF EXPERIENCING REALITY
Speaker, New York Global Conversation 2014, New York, 10/2014

ON THE FUTURE OF DIGITAL CHARACTERS
Keynote Speaker, Vivid Sydney, Sydney, 06/2014

HUMAN CAPTURE WITH DEPTH SENSORS
Keynote Speaker, Making Augmented Reality Real, NAIST, Nara 08/2014
Invited Talk, Victoria University, Wellington, 07/2014
Chalk Talk, Weta Digital, Wellington, 07/2014
Invited Talk, Pelican Imaging Corporation, Mountain View, 05/2014

3D SELFIES!
Speaker, Depth Camera Birds of Feather, SIGGRAPH 2014, Vancouver, 08/2014
Speaker, FMX 2014, Stuttgart, 04/2014

DEMOCRATIZING 3D SCANNING FOR 3D PRINTING
Speaker, USC Trustee Conference, La Quinta, 03/2014

3D HUMAN CAPTURE: FROM VFX TO THE MAINSTREAM
Speaker, Interactive Media Forum, USC's School of Cinematic Arts, Los Angeles, 04/2014
Speaker, CESASC 52nd Annual Convention, San Gabriel, 04/2014
Invited Talk, University of California, Santa Barbara, 02/2014

HOW DEPTH SENSING TECHNOLOGY WILL CHANGE US
Speaker, Tech Plus Forum (tech+), Seoul, 11/2013

DEMOCRATIZING HUMAN CAPTURE
TR35 Talk, EmTech MIT 2013, Cambridge, 10/2013

3D HUMAN CAPTURE FOR EVERYONE
Invited Talk, SIAT Chinese Academy of Sciences, Shenzhen, 11/2013
Invited Talk, Harvard University, Cambridge, 10/2013

LOW-IMPACT HUMAN DIGITIZATION AND PERFORMANCE CAPTURE
Invited Talk, Dreamworks Animation, Glendale, 08/2013

DIGITIZING HUMANS IN MOTION FROM A GEOMETRIC PERSPECTIVE
3D Imaging and Computing 2012, National Chiao Tung University, Hsinchu, 12/2012

DYNAMIC SHAPE RECONSTRUCTION AND TRACKING
R&D Forum, Industrial Light & Magic, Letterman Digital Arts Center, San Francisco, 04/2012

GEOMETRIC CAPTURE OF HUMAN PERFORMANCES
Faculty Candidate Seminars, Department of Computer Science, Columbia University, New York, 03/2012
Guest Presentation, Rhythm & Hues Studios, Los Angeles, 03/2012
Chalk Talk, Digital Domain, Venice, 03/2012
CS Colloquium Series, Computer Science Department, University of Southern California, Los Angeles, 03/2012

MAYA FOR GRAPHICS SCIENTISTS
Invited Talk, Princeton Computer Graphics Group, Princeton University, New Jersey, 02/2012

TRACKING DEFORMABLE SURFACES
Computer Graphics Reading Group, University of Pennsylvania, Philadelphia, 01/2012

CAPTURING 3D ANIMATION FOR ENTERTAINMENT AND SCIENCES
CVGC Seminar, Columbia Computer Graphics Group, Columbia University, New York, 12/2011

DYNAMIC SHAPE CAPTURE WITH APPLICATIONS IN ART AND SCIENCES
Invited Talk, Microsoft, Redmond, 11/2011

NON-RIGID REGISTRATION IN ENTERTAINMENT AND SCIENCE
Invited Talk, Department for Perceiving Systems, Max-Planck-Institut für Intelligente Systeme, Tübingen, 09/2011

HUMAN BODIES, FACES, AND HAIR
Guest Lecture, Courant Institute of Mathematical Sciences, New York University, New York, 09/2011

ROBUST NON-RIGID 3D ALIGNMENT AND APPLICATIONS
R&D Seminar, Vision Technologies, SRI International/Sarnoff Corporation, New Jersey, 07/2011

CAPTURE, RECONSTRUCT, TRACK, RIG, RETARGET!
Invited Talk, Princeton Computer Graphics Group, Princeton University, New Jersey, 08/2010

INVERSE ENGINEERING DYNAMIC SHAPES FOR COMPUTER ANIMATION
Invited Talk, Courant Institute of Mathematical Sciences, New York University, New York, 08/2010

ANIMATION RECONSTRUCTION
Invited Talk, Columbia Computer Graphics Group, Columbia University, New York, 08/2010

GENERATING BLENDSHAPES FROM EXAMPLES AND CAPTURING WATERTIGHT HUMAN PERFORMANCES
R&D Seminar, Industrial Light & Magic, Letterman Digital Arts Center, San Francisco, 08/2010

A PRACTICAL FACIAL ANIMATION SYSTEM: FROM CAPTURE TO RETARGETING
Research Seminar, Pixar Animation Studios, Emeryville, 08/2010

ART-DIRECTABLE AND DATA-DRIVEN FACIAL ANIMATION
Invited Talk, Institute of Animation, Visual Effects and Digital Postproduction, Filmakademie Baden-Württemberg, Ludwigsburg, 05/2010

ROBUST RECONSTRUCTION OF DYNAMIC SHAPES AND REAL-TIME FACIAL ANIMATION
Invited Talk, Institute for Creative Technologies, University of Southern California, Marina del Rey, 11/2009

DEFORMING GEOMETRY RECONSTRUCTION AND LIVE FACIAL PUPPETRY
R&D Seminar, Industrial Light & Magic, Letterman Digital Arts Center, San Francisco, 10/2009

ANIMATION RECONSTRUCTION FROM A SINGLE-VIEW
Invited Talk, Computer Graphics Department, Max-Planck-Institut für Informatik, Saarbrücken, 05/2009

ACTIVE SHAPE ACQUISITION: FROM IMAGES TO 3-D SURFACES
Invited Talk, Graduate School of Global Information and Telecommunication Studies, Waseda University, Tokyo, 06/2006

3D SCANNING FOR EVERYONE
Ninth SIAM Conference on Geometric Design and Computing (SIAM-GD'05), Phoenix, Arizona, 10/2005

SURFACE RECONSTRUCTION USING COLORED STRIPE PROJECTIONS
Graphics Lunch Seminar, Computer Graphics Laboratory, ETH Zurich, 09/2005

REKONSTRUKTION MIT STRUKTURIERTEM LICHT
First Status Report Meeting of the Institute for Scientific Computing and Mathematical Modeling, Universität Karlsruhe (TH), 04/2005

SOFTWARE & DATASETS

Pinscreen
http://www.pinscreen.com
A mobile app that allows anyone to instantly create a 3D avatar by uploading a selfie or an arbitrary 2D photograph. The avatar can then be animated using the phone camera and produce AR selfie content or Animojis. The software can be downloaded from Apple's App Store and has been developed by the entire Pinscreen team.

USC-HairSalon
A large publicly accessible 3D hairstyle database for hair capture, modeling, simulation, and rendering research. This data collection is also a great resource for benchmark and evaluation purposes. My co-authors are Liwen Hu, Chongyang Ma, and Linjie Luo.

Shapify.me
http://www.shapify.me
A free application for creating 3D self-portraits directly using Microsoft's Kinect sensor. A person rotates in front of the sensor and the software automatiaclly produces a complete textured digital model of the person. The 3D model can be uploaded to a server and 3D printed. My co-authors are E. Vouga, A. Gudym, and G. Gusev.

ILM's Monster Mirror
Industrial Light & Magic's proprietary depth sensor-driven real-time facial animation system for instantaneous high fidelity facial performance capture for virtual filmmaking. The calibration-free system sets the current bar for realtime facial tracking accuracy and robustness. I co-developed the software with J. Yu, Y. Ye, and C. Bregler.

BeNTO 3D
http://www.bento3d.com
An easy to use geometry processing application created exclusively for Mac. The Cocoa based tool distinguishes from other competitors in that development of additional plugins and GUI extensions are considerably simplified.

face*shift*
http://www.faceshift.com
A software for real-time and markerless facial performance capture using Microsoft's Kinect sensor. The Qt-based application runs on Mac OS X and Windows 7 and is co-developed with T. Weise and S. Bouaziz. Faceshift has been acquired by Apple Inc. and its technology has been incorporated into the iPhone X.

Artec Studio
http://www.artec3d.com
Development of a state-of-the-art geometry processing pipeline for aligning and merging non-rigid 3D scan data.

PROFESSIONAL ACTIVITIES

Co-Curator and Member of the Global Future Councils
World Economic Forum (WEF) - Virtual and Augmented Reality Transformation Maps 2017, 2018, and 2019

Associate Editor
Computer Graphics Forum 2016-2019

Co-Organizer
CONIX Mixed Reality Workshop 2018, USC Institute for Creative Technologies, Playa Vista, 08/2018

Program Committee (Computer Graphics)
ACM SIGGRAPH 2015 and 2016
ACM SIGGRAPH Asia 2017 and 2018
ACM SIGGRAPH Asia (Technical Briefs & Posters) 2014, 2015, and 2016
ACM SIGGRAPH Asia (E-Tech) 2013, 2014, 2015, and 2016
ACM SIGGRAPH Asia (Symposium in Mobile Graphics and Interactive Applications) 2015
Symposium on Computer Animation 2013, 2014, 2015, 2016, 2017, and 2018
Symposium on Geometry Processing 2012, 2016, 2017, 2018, and 2019
Eurographics 2014, 2015, and 2016
Eurographics (STAR) 2015
Eurographics (Short Papers) 2013, 2014, and 2015
Pacific Graphics 2012, 2013, 2014, 2015, 2016, 2017, and 2019
Shape Modeling International 2013 and 2017
International Conference on Computer Aided Design and Computer Graphics 2013 and 2015
International Conference on Computer Animation and Social Agents 2014, 2015, and 2016

Program Committee (Computer Vision)
IEEE International Conference on Computer Vision and Pattern Recognition 2017, and 2018
IEEE CVPR Workshop on Morphable Face Models: from Present to Future 2018

International Conference on 3D Vision 2014 and 2015
International Symposium on 3D Data Processing, Visualization and Transmission 2010
Workshop on Non-rigid Shape Analysis and Deformable Image Alignment 2010, 2011, 2012, and 2014

Reviewer

ACM SIGGRAPH 2008, 2009, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, and 2019
ACM SIGGRAPH Asia 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, and 2018
ACM Transaction on Graphics 2010, 2011, 2013, 2015, 2016, 2017, and 2018
IEEE International Conference on Computer Vision and Pattern Recognition 2016, 2017, 2018, and 2019
International Conference on Computer Vision 2017 and 2019
European Conference on Computer Vision 2016
ACM User Interface software and Technology Symposium 2014
Symposium on Computer Animation 2013, 2014, 2015, 2016, 2017, and 2018
Symposium on Geometry Processing 2007, 2008, 2012, 2016, 2017, 2018, and 2019
Eurographics 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, and 2017
Computer Graphics Forum 2010, 2011, 2016, 2017, and 2018
International Conference on 3D Vision 2014 and 2015
Workshop for Women in Machine Learning 2018
IEEE International Symposium on mixed and Augmented Reality 2015
3D Data Processing, Visualization and Transmission 2010
Non-rigid Shape Analysis and Deformable Image Alignment 2010, 2011, 2012, and 2014
Transactions on Visualization and Computer Graphics 2009, 2012, 2013, 2014, 2015, 2016, 2017, and 2018
Transactions on Pattern Analysis and Machine Intelligence 2007, 2012, and 2017
International Journal of Computer Vision 2015
IEEE Computer Graphics and Applications 2013
International Conference on Computer Animation and Social Agents 2014, 2015, and 2016
EURASIP Journal on Advances in Signal Processing 2011
Graphical Models 2014
Computers & Graphics 2013 and 2014
Asian Conference on Computer Vision 2010
Pacific Graphics 2009, 2011, 2012, 2013, 2014, 2015, 2016, and 2017
Vision, Modeling, and Visualization Workshop 2006
Geometric Modeling and Processing 2006
Computer-Aided Design 2013

Chair

International Conference on 3D Vision 2019 Area Chair
International Conference on 3D Vision 2017 Area Chair
SIGGRAPH Asia 2018 Session Chair
SIGGRAPH Asia 2017 Session Chair
SIGGRAPH 2017 Session Chair
SIGGRAPH 2016 Session Chair
SIGGRAPH 2015 Session Chair
SIGGRAPH Asia (E-Tech) Prize 2013 and 2014
International Conference on 3D Vision 2015 Area Chair

Panels

Judge's Panel for the MIT TR 35 Innovators of 2019	**03/2019**
National Science Foundation (FW-HTF) Research Proposal	**07/2018**
Judge's Panel for the MIT TR 35 Innovators of 2018	**03/2018**
Qiu Shi Outstanding Young Scholar Award Selection Committee	**05/2017**
Judge's Panel for the MIT TR 35 Innovators of 2017	**05/2017**
European Research Council Research Proposal	**12/2016**
Judge's Panel for the MIT TR 35 Innovators of 2016	**05/2016**
European Research Council Research Proposal	**12/2015**

Judge's Panel for the MIT TR 35 Innovators of 2015 **04/2014**
Swiss National Science Foundation Research Proposal **12/2014**
Judge's Panel for the MIT TR 35 Innovators of 2014 **05/2014**

Membership

World Economic Forum Global Future Councils **11/2018 - ongoing**
ACM SIGGRAPH **06/2006 - ongoing**
Eurographics Association **08/2011 - ongoing**
National Academy of Inventors **05/2017 - ongoing**
World Future Society **08/2017 - ongoing**

BOARD

Tekcapital, Scientific Advisory Board **08/2017**
European Conference on Visual Media Production, Scientific Advisory Board **02/2017**
Pinscreen Inc., Board of Director **10/2015**
Pelican Imaging, Technical Advisory Board **09/2014 - 11/2016**

EXTRACURRICULAR ACTIVITIES

World Economic Forum, Annual Meeting of the Global Future Councils, Dubai 11/**2018**
Lucasfilm Training LDAC, Practical & CG Cinematography, San Francisco **08/2009**
Credit Suisse Group, Equity Derivatives Workshop, Zurich **03/2008**
McKinsey&Company, Business Technology Office's European Seminar, Portugal **05/2007**

TECHNICAL SKILLS

Operating Systems
Mac OS X, Linux/Unix, and Windows

Programming Languages
C/C++, Objective C, Python, Java, and HTML/CSS

Professional Tools

Unity, Autodesk Maya, Autodesk 3ds MAX, Pixologic ZBrush, Zeno, Adobe AfterEffects, Adobe Premiere, Adobe Photoshop, and Adobe Illustrator

MILITARY SERVICE

German Federal Armed Forces **11/1999 - 08/2000**
Division for Special Operations (DSO) - Airborne Brigade 26
2nd Company of the Antitank Parachute Battalion 262, Merzig, Germany

- German parachutist badge in bronze

REFERENCES

Prof. Dr. Leonidas J. Guibas

Paul Pigott Professor of Computer Science and Electrical Engineering
Stanford University, Computer Science Department
Email guibas@cs.stanford.edu
Home page http://geometry.stanford.edu/

Prof. Dr. Wojciech Matusik

Associate Professor of Computer Science
Massachusetts Institute of Technology, Department of Electrical Engineering and Computer Science
Email wojciech@mit.edu
Home page http://people.csail.mit.edu/wojciech

Prof. Dr. Michael J. Black
Director and Distinguished Amazon Scholar
Max Planck Institute for Intelligent Systems, Perceiving Systems Department
Email black@tuebingen.mpg.de
Home page http://ps.is.tue.mpg.de

Dr. Chris Bregler
Senior Staff Scientist
Google AI
Email bregler@google.com
Home page http://chris.bregler.com/

Kim Libreri
Chief Technology Officer
Epic Games
Email available upon request
Home page http://epicgames.com/